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# Stabilization and Growth Recovery in Mexico

## Lessons and Dilemmas

Daniel F. Oks

The right combination of orthodox and heterodox policies can bring inflation down and induce sustained economic recovery in Mexico — and has done so. But a few loose ends remain: a sharp decline in private savings and the continuing appreciation of the peso.

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Before 1988, "orthodox" policies (fiscal discipline and tight money) failed to bring inflation down and induce a sustained economic recovery. The Mexican stabilization plan announced in December 1987 (the Pact) shows that the right combination of orthodox and "heterodox" policies (for example, income policies) can meet, and has met, both objectives.

Oks shows that although many orthodox adjustments — especially of fiscal policy and domestic debt management — were begun before the Pact, considerable further adjusting was needed before it could succeed. To make the stabilization credible required significantly tighter fiscal policy and a lengthening of the maturities of domestic debt between 1988 and 1990.

A key factor behind high real interest rates during the recent Mexican stabilization plan was the initially low credibiliy of the fixed — and later the preannounced — exchange rate. While it is difficult to assess what establishes credibility, we can hypothesize about the factors that may hamper it. Crucial among them is the consistency of the macroeconomic policy framework, where fiscal policy plays a key role. Domestic debt management also matters as the probability of a successful run on the peso increases with the amount of government liabilities that could, in a given period, be exchanged for foreign reserves. For example, if the average maturity of domestic debt is low, as it was in Mexico at the beginning of the stabilization plan, this probability is high — and thus also shows up in high interest premia between peso-denominated and dollar-denominated debt.

The Pact succeeded in stabilizing prices without a recession, but a few loose ends remain:

- The sharp decline in private savings which has not been fully offset by higher public saving, causes many to question the sustainability of the recent economic recovery. In particular, it makes Mexico more vulnerable to volatile private capital flows.

- The continued real appreciation of the peso risks bringing a slowdown or recession over the medium term.

In the short term, Mexico may not have other options than further tightening its fiscal and monetary policies. Over the medium term, however, a real peso depreciation appears necessary so that extra output from new investment can be absorbed.

Contents.



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[1] This paper draws from my contribution to several World Bank reports on Mexico. I thank Sweder van Wijnbergen and Joaquin Cottani for useful suggestions and comments and Rebecca Brideau for able research assistance.

## 1. INTRODUCTION AND SUMMARY.

Prior to 1988 "orthodox" policies, fiscal discipline and tight money, failed to bring down inflation and induce a sustained economic recovery. One well established fact from the Mexican stabilization plan announced in December 1987, the Pact, is that a proper combination of "orthodox" with "heterodox" policies, e.g., income policies, can achieve, and indeed has achieved, both objectives. The type of lesson with which we are concerned here, though, focuses on the role played by orthodox policies. I show that, despite the fact that much of the orthodox adjustements were in place before the Pact, the Pact and, in particular, the quasi-fixed exchange rate associated to it, required considerable further fiscal adjustment and able debt management before it could succeed. I conclude with a brief discussion of some medium-term problems created by the quasi-fixed exchange rate regime and policy options.

The significant tightening of fiscal policy and lengthening of domestic debt maturity during 1988-90 were crucial to confront the initial lack of credibility of the stabilization program. Without these policies high real interest rates, largely associated with lack of credibility of the exchange rate policy, could have derailed the stabilization program. In 1988-89 the real domestic interest service was twice more burdensome than the nominal foreign interest service (even though foreign public debt was more than twice the size of domestic debt) and it absorbed three-quarters of total tax revenue (compared to 30% in 1985-87). This implied that, despite the initially tight fiscal situation, further fiscal adjustment was required. But fiscal adjustment was not enough. Debt management also played a key role. In particular, the lengthening of domestic debt maturing in the short term contributed to lessen unscheduled devaluation expectations and, thus, bring down interest rates to more manageable levels. The lengthening of debt maturity lowered unscheduled devaluation expectations by reducing the amount of government liabilities that in a given period the government could have been forced to exchange for reserves (previous exchange for base money), e.g., if there was a speculative run on the peso. The empirical evidence also showed that foreign debt and debt service reduction, brought about by the 1989-90 debt agreement with commercial banks, also contributed to lower domestic interest rates, presumably through its stabilizing influence on foreign exchange markets.

The Pact has succeded in stabilizing prices, after running at three digits inflation dropped to an average of 23% in 1989-91, while avoiding a recession. In fact, after modest growth in 1988 the economy has been growing at about 3-4% in 1989-91. A distinctive feature of Mexico's most recent economic recovery is that it has been driven by the private sector. A good measure of renewed private sector confidence is provided by the massive private capital inflows (including capital repatriation) that Mexico received: US$18 billion in 1989-90 and a further US$17 billion estimated for 1991. These inflows financed large foreign reserve accumulation, about US$10 billion in 1990-91, as well as fast growing private investment.

However, private consumption also boomed and, combined with higher investment, they explain the sharp current account deterioration observed since 1987. From a macroeconomic point of view this is largely explained by the

favorable effect of a more appreciated peso on investment, by reducing the cost of capital goods, and by the adverse effect of a more appreciated peso on private saving. In the short term Mexico may not have other options than further tightening its monetary and fiscal policies as its exchange rate policy is strongly tied to the anti-inflationary strategy and the peso is likely to continue appreciating in real terms. Over the medium term a real peso depreciation appears necessary, however, because as time goes by the risk of a recession induced by an appreciating real exchange rate will increase; domestic and foreign investors will require a more depreciated exchange rate to absorb extra output from their new investments.

Section 2 provides the basic macroeconomic background. Section 3 discusses the credibility problem presented by the exchange rate policy; Section 4 then discusses the role of fiscal policy and debt management to overcome the credibility problem. Section 5 concludes with a brief examination of the risks entailed by the current exchange rate strategy and medium-term policy options.

## 2. THE "PACTO": STABILIZATION AND GROWTH RECOVERY.

In the 1970s fast economic growth, abundant foreign finance, and low interest rates contributed, despite growing public expenditure, to keep inflation and domestic public debt low. The picture changed drastically in the 1980s as the drying up of foreign finance, massive capital flight, lower oil prices and the ensuing output stagnation forced the government to unprecedented fiscal and real exchange rate adjustments (Figures 1 and 2). Fiscal austerity was characterized by a drastic reduction in capital expenses, about 7 percentage points of GDP between 1981 and 1986, as well as a large increase in public sector prices. Fiscal policy was further tightened following the 1985-86 oil crisis (Figure 2). However, despite these adjustments the large transfer to foreign creditors, equivalent to 4.8% of GDP on average in 1983-87, implied increased reliance on domestic sources of finance, that is, on debt issue and on inflationary taxation (Figures 3 and 4). Despite the alleviation brought about by foreign debt rescheduling in 1982-83, 1984-85 and 1986-87 per capita income continued dropping. Inflation, closely associated with a de-facto targetting of the real exchange rate, kept growing (Figure 5). The depreciated exchange rate, though, contributed to improve the current account balance which turned from a US$ 16 billion deficit in 1981 to a US$ 4 billion surplus in 1987. Associated with the growing trade surplus, there was a mild recovery in 1987. That year there was also a boom in the stock market. However, as in most world stock markets, it ended in a crash. Strong speculation against the peso, partly fuelled by heavy foreign debt-equity swap activity, prompted a new exchange rate and inflation crisis.

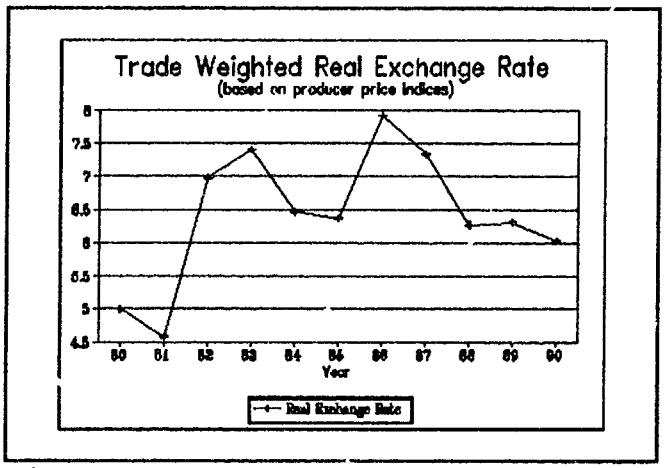


Figure 1

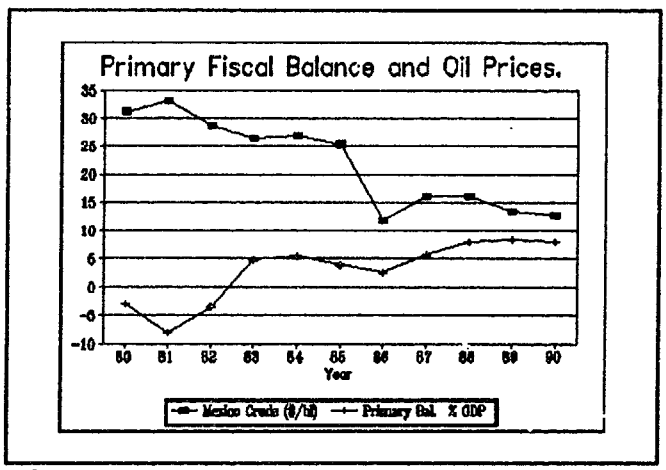


**Figure 2**

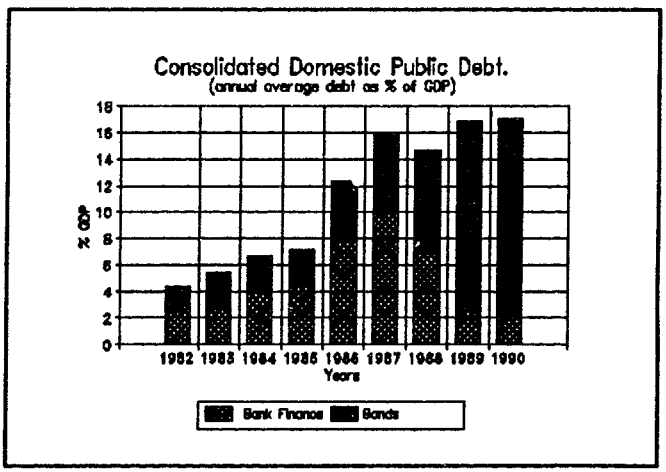


**Figure 3**

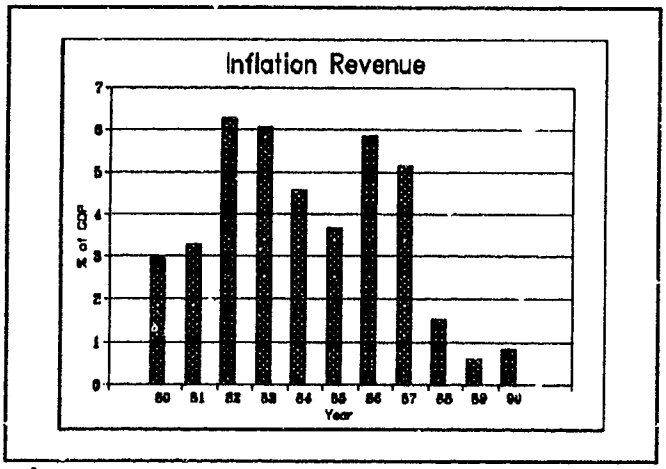


**Figure 4**

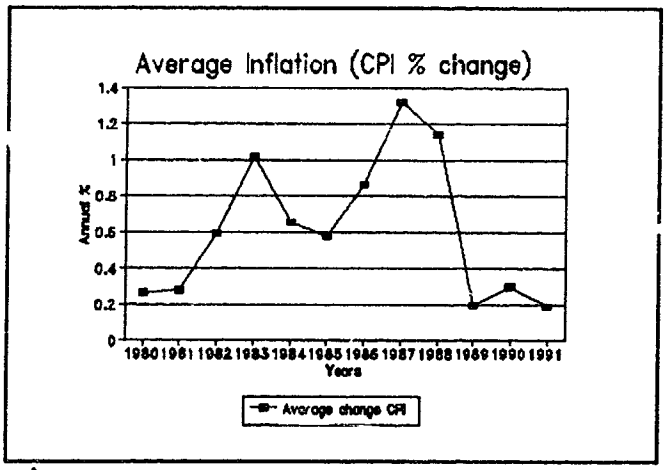


**Figure 5**

The late 1987 inflation episode triggered a change in the anti-inflation strategy. High reserves, low real wages and a depreciated exchange rate provided adequate conditions for the use of nominal anchors, e.g., price-wage controls and a fixed exchange rate, to fight inflation; precisely what the government did in December 1987. 2/ The government signed a Pact of Economic Solidarity ("Pacto de Solidaridad Economica" - PSE) with the business, labor and agriculture sectors. The Pact, which combined "orthodox" policy instruments (e.g., fiscal policy) with "heterodox" policy instruments (e.g., income policy), was aimed at stabilizing the economy while avoiding a recession. It entailed monetary and fiscal tightening, an initial devaluation and wage adjustment and a subsequent fixing of these variables until the end of February 1988, limited price

2/ See Ortiz (1990).

adjustments for all goods in a "basic" commodity basket, and an acceleration of the process of trade liberalization (started in 1985), e.g., maximum tariffs were halved to 20% and import licensing was reduced from 100% to about 15%. In view of the initial success the Pact was extended in March, May, August and October 1988 de-facto freezing minimum wages (after a small initial adjustment), controlled and public sector prices and the exchange rate for the rest of 1988.

By and large the Pact objectives were attained: inflation dropped from 67% during the second half of 1987 to 6% during the same period in 1988 and a recession was avoided. Economic activity started to pick up in the last quarter of 1988, after political uncertainties surrounding the mid-year presidential elections and the future course of economic policy receded. In December 1988 the new government agreed with business, labor and agriculture sector representatives to a new phase of the Pact: the renamed Pact for Economic Growth and Stability ("Pacto de Estabilidad y Crecimiento Economico" - PECE). The new Pact continued with the stabilization objective but incorporated explicitly the objectives of foreign debt reduction and growth recovery.

Fiscal policy remained tight, the primary fiscal surplus averaged 8% of GDP in 1988-90, while public sector prices, controlled prices and minimum wages were moderately adjusted (Figure 6). Economic policy under the new Pact, and under its subsequent renovations (the last one in November 1991), brought several other innovations. First, it introduced a preannounced daily devaluation of the peso against the dollar at the rate of 1 peso a day, equivalent to a 16% annual devaluation, gradually reduced thereafter, to a 2.4% annual devaluation in 1992. Second, financial liberalization was deepened leading both to a sharp increase in deposits and credit; since 1989 interest rates were set competitively by banks, credit ceilings and legal reserve requirements were eliminated (banks were required to hold 30% of their assets in government bonds and/or cash reserves). Third, in 1989-90 the new administration renegotiated its external commercial debt bringing about substantial debt and debt service reduction; several agreements signed with the IMF, World Bank, Japan and Paris Club in early 1989 paved the way and provided the resources for the commercial debt reduction agreement. The debt relief package, which restructured US$48 billion of Mexico's foreign debt, reduced the net transfer Mexico needs to make to its creditors by slightly less than 2% of GDP over the 1989-1994 period on average; half of this amount was due to the lengthening of maturity implied by the deal, 0.5% of GDP was due to net interest savings and the rest was due to new money.

The new Pact or PECE was overall succesfull. In 1989 inflation averaged 20% and, for the first time since the debt crisis erupted, per capita real income growth was positive. Economic growth accelerated, driven by private investment and, to a lesser extent, private consumption, to an average 3.7% in 1989-91. Inflation rebounded somewhat, to 30% in 1990. This, though, was by and large the result of a flexibilization of the Pact. Public sector prices and private sector controlled prices were adjusted several times between late 1989 and late 1991, while various controlled prices were effectively decontrolled. In 1991 inflation resumed a downward path despite continued price flexibilization and substantial public price adjustments. However, inflation gains came along with a strong real peso appreciation and a sharp deterioration in the non-oil trade balance.

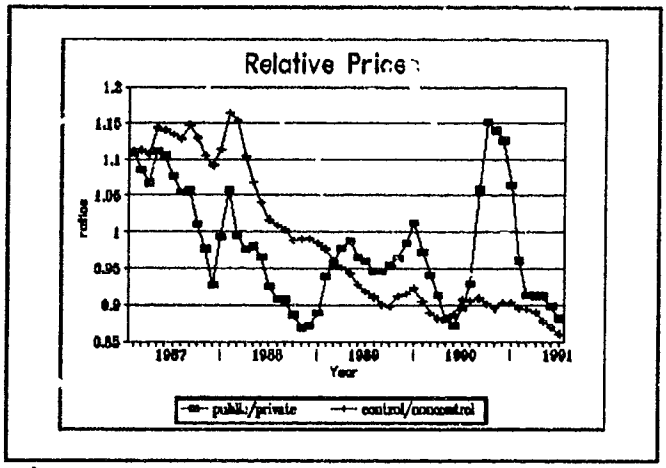


**Figure 6**

## 3. POLICY CREDIBILITY, DEBT REPUDIATION RISKS AND HIGH INTEREST RATES.

Despite the rapid success in bringing down inflation, domestic real interest rates during the first two years of the Pact were extremely high: on average in excess of 30%. High real interest rates, rather than the debt stock, threatened the stabilization program by increasing the cost of servicing domestic debt, and by hindering investment and, hence, the economic recovery. In this section I argue that behind high real interest rates was: i) the initially low credibility about the fixed/preannounced exchange rate and, to a lesser degree, ii) fears of explicit debt repudiation. The initial lack of credibility led the public to systematically overestimate the exchange rate devaluation, i.e., Mexico in the late 1980's provided a fresh example of the "peso problem" (Krasker 1980). A survey of devaluation expectations conducted by INEGI (the National Institute of Statistics) illustrates this (Figure 7). In the next section I will argue that Mexico's tight fiscal policy and able debt management, helped eventually to bring down real interest rates. In other countries undergoing similar stabilization strategies, e.g., Brazil and Argentina, but without the same ability to tighten fiscal policy and/or manage public debt, high real interest rates led to situations of fast growing domestic debt growth and unsustainable exchange rate/inflation targets (Beckerman 1991).

At the core of the anti-inflation strategy was a first fixed and later on quasi-fixed exchange rate (a preannounced declining rate of devaluation). This, along with price and wage controls, provided nominal anchors for prices and, thus, for inflation. However, at least initially financial markets did not believe that the fixed/quasi-fixed exchange rate, and for that matter the stabilization strategy itself, was going to be maintained. This lack of policy credibility led to high devaluation expectations and exchange rate uncertainty as measured by the differential between interest rates on peso-denominated public debt (Cetes) and interest rates on dollar-indexed domestic debt (Pagafes) plus

the rate of preannounced devaluation (Figure 8).

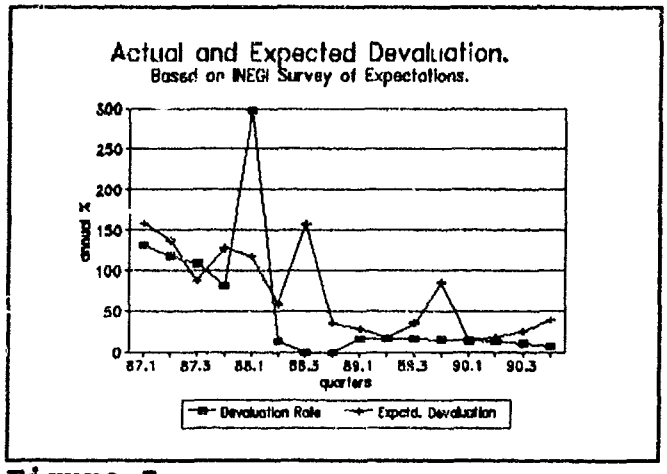


**Figure 7**

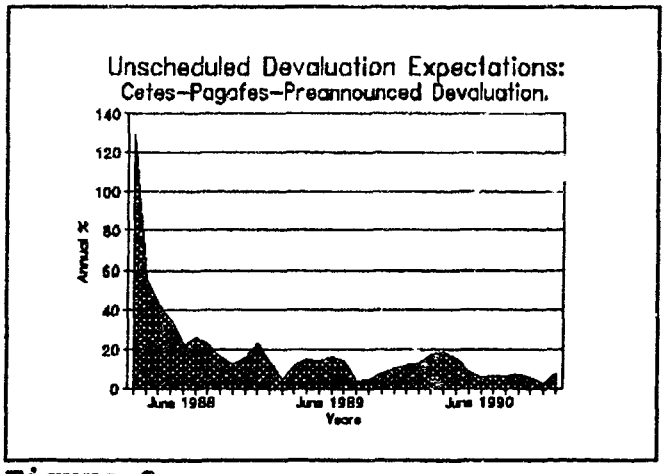


**Figure 8**

A different type of risk, also reflected in high interest rates during the first phases of the Pact, was associated with the fear of explicit debt repudiation. Explicit debt repudiation refers to default through taxation or sheer debt repudiation; in contrast with implicit debt repudiation through unanticipated devaluation/inflation. The explicit debt repudiation risk premium can be measured by the interest differential between dollar-indexed domestic debt (Pagafes) and a risk-free dollar interest rates, we use as a proxy the US Treasury Bill. This premium rose substantially during the first phase of the Pact and remained large until mid 1989 (Figure 9). Explicit debt repudiation fears in Mexico can be traced back to the 1982 forced conversion of dollar bank deposits at an artificially low exchange rate.

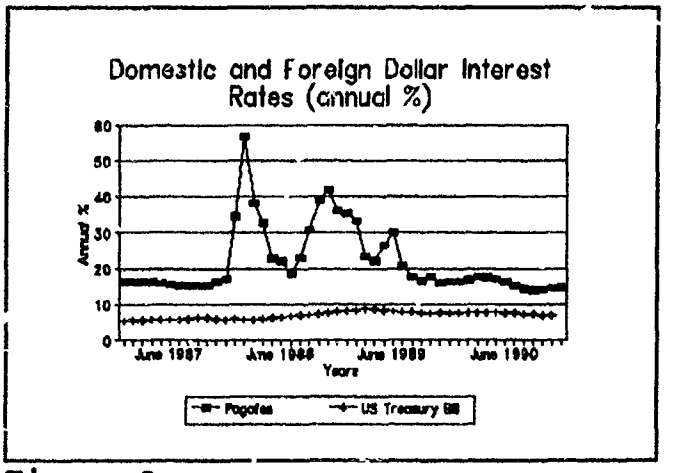


**Figure 9**

Both interest premia, the Cetes-Pagafes and the Pagafes-US Treasury Bill interest differentials, dropped sharply in 1988-91. Their behavior, however, was driven by different policy factors and indeed exhibit different patterns. While both interest differentials measure debt repudiation risks (the former implicit and the latter explicit), and to that extent are similarly affected by policy variables influencing the solvency of government, the Cetes-Pagafes interest differential more specifically measures unscheduled devaluation expectations/exchange rate uncertainty which is influenced directly by movements and expectations in foreign exchange markets. For example, unscheduled devaluation expectations/exchange rate uncertainty may be driven by the perception of growing external imbalances or by the risk that a confidence crisis may leave the central bank without enough foreign exchange reserves to sustain the preannounced exchange rate, rather than by solvency considerations.

## 4. FISCAL POLICY AND DEBT MANAGEMENT.

How did fiscal policy and debt management contribute to reduce the risk of explicit debt repudiation and/or devaluation expectations and, through them, interest rates? These issues are examined respectively in Subsections 4.1 and 4.2.

### 4.1 Factors Behind Explicit Debt Repudiation Risk Premia.

What lies behind explicit debt repudiation fears as measured by the interest differential between dollar-indexed domestic debt (Pagafes) and US Treasury Bills? The likelihood of debt repudiation depends on the ability as well as the willingness of the government to service its debt. A government's

willingness to service debt stems from a variety of factors affecting costs and benefits of default. However, while the benefits from default are straighcforward, the reduced debt service, costs are more difficult to assess and measure and, in any case, governments may not be always careful in evaluating them. It is easier to assess the ability to service public debt, i.e., the perceived solvency of government. A government's ability to service a given stock of debt can be assessed by comparing the present discounted values of future debt service obligations and future primary (non-interest) fiscal surpluses.

The risk of explicit debt repudiation, e.g., through an unscheduled tax on debt, may also be affected by debt management-specific factors such as the level of debt indexation. For a given debt stock (of indexed and non-indexed debt) the higher the degree of indexation the less likely that non-indexed (nominal) debt will be implicitly repudiated through inflation (as the base for implicitly repudiating debt through inflation narrows) and, thus, the more likely that, if the government is to repudiate its debt, it will do it explicitly (Calvo-Guidotti 1990). Thus, the explicit debt repudiation risk premium may increase with the level of indexation even if the overall risk of debt repudiation is unchanged. Casual evidence supports this hypothesis. In 1988 as the share of dollar-indexed debt rose from almost zero to more than 5% of domestic debt (indexed debt includes dollar-indexed Pagafes and inflation-indexed Ajustabonos in Figure 10), the explicit debt repudiation risk premium, approximated by the Pagafes-US Treasury bill interest differential, more than doubled (Figure 9). This may explain the subsequent reluctance of the government to keep issuing indexed debt (Figure 10).

Another important factor influencing the risk of domestic debt repudiation, both explicit and implicit, was the foreign debt agreement. In July 1989, when the agreement for restructuring commercial foreign debt was formally announced, both implicit and explicit debt repudiation risk premia dropped sharply (Figures 8 and 9). The debt agreement reduced the net transfer Mexico needs to make to its commercial creditors and brought substantial debt and debt service relief. Lower transfers and debt relief enhanced Mexico's ability to service all public debt, foreign and domestic, thus, reducing fears of both domestic and foreign debt repudiation. In turn, debt relief and the significantly lengthened debt maturity helped to dispel fears of new debt renegotiations thus reducing macroeconomic and, in particular, exchange rate uncertainty. [3/]

To test these hypotheses about the factors that influence the explicit debt repudiation risk premium we run a linear regression with the Pagafes-US Treasury Bill interest differential, the proxy for the debt repudiation risk premium, as dependent variable. Based on the above discussion, the explanatory variables were, apart from the constant term, the primary fiscal surplus lagged up to two months, the degree of debt indexation and a dummy for the foreign debt agreement. A regression was run for the March 1987-December 1990 period using monthly data. To calculate the net present value of primary surpluses agents require knowledge

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3/ S. van Wijnbergen 1991 a) analyzes the direct and indirect (domestic) effects of the Brady deal: indirect gains (via lower interest rates) were at least as large as the reduction in the external transfer to foreign creditors.

of future primary surpluses which, of course, they don't know. The most they may know is the value of current and lagged primary surpluses, the proxy which in fact we used as regressor. The degree of debt indexation, in turn, was measured by the ratio of indexed to non-indexed debt. Indexed debt comprised both inflation and dollar-indexed debt instruments. The dummy for the debt agreement took value one after the deal announcement in July 1989.

The hypotheses described above are supported by the econometric evidence reported in Annex 1. The additional tightening of fiscal policy since 1988, captured by increases in real primary fiscal surpluses, led to lower explicit debt repudiation risk premia. Increases (reductions) in the level of debt indexation were associated with increases (reductions) of debt repudiation risk premia. Finally, as expected, the 1989 foreign debt agreement (captured by a dummy) reduced risk premia.

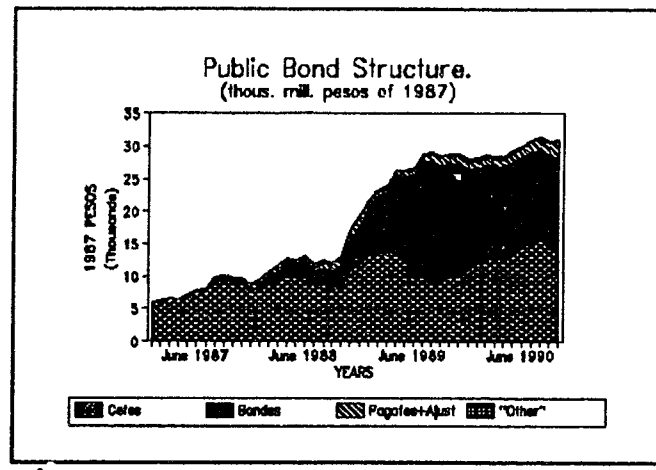


**Figure 10**

4.2 Factors Behind Devaluation Expectations/Exchange Rate Uncertainty.

We now turn to factors underlying policy credibility as measured by unscheduled devaluation expectations/exchange rate uncertainty. Unscheduled devaluation expectations/exchange rate uncertainty were extremely high in 1988, declined in 1989, particularly during the months following the announcement of the debt deal, and then fell again substantially after the first quarter of 1990 (Figure 8). Factors governing unscheduled devaluation expectations are difficult to identify. However, we know that if the government is to resist a speculative attack on the currency, whether originating from private misperceptions or not, at least the stock of base money must be backed by foreign exchange reserves. In the case of Mexico, though, where the government had frequent and high funding requirements, e.g., domestic public debt, equivalent to approximately 20% of GDP, had an average maturity of less than a month, non-monetary government obligations also mattered due to their potential impact on base money growth. To amortize

short-term debt the government could be forced to issue more base money if, for example, investors lacking credibility are unwilling to take any interest rate since they believe that the rate of devaluation would exceed it. In this case, the stock of reserves may not suffice to back the stock of base money expected for the end of the period (even if the initial stock of base money is fully backed by reserves) and, thus, the probability that a speculative attack may force a devaluation increases.

Thus, one alternative which governments have to reduce the probability of a succesful run on their currency is to lengthen domestic debt maturity, a point made by Giavazzi-Pagano (1989). Giavazzi-Pagano showed in fact that lengthening debt maturity could help to rule out equilibria with positive probability of devaluation. In their framework, though, the collapse of the exchange rate regime is prompted by the growing debt service that results from having to refinance short-term debt at high interest rates when a confidence crisis arises.

The variable which we propose to explain the probability of an unscheduled devaluation (the interest premium of peso-denominated over dollar-denominated domestic debt), thus, is the difference between the sum of the stock of public debt maturing in the month and the stock of base money on one hand, and the stock of foreign exchange reserves on the other hand.

In order to assess empirically this hypothesis we postulate a binary stochastic process to describe the formation of unscheduled devaluation expectations. We then run a regression of the Cetes-Pagafes interest differential (adjusted for the preannounced devaluation) where the process describing unscheduled devaluation expectations provides the regressors. Under the binary process agents either expect no devaluation (on top of the preannounced one) or a fixed unscheduled devaluation. The probability of an unscheduled devaluation depends on the variable defined above, i.e., the difference of the sum of public debt maturing in the month and base money on one hand, and foreign exchange reserves on the other hand. The size of the fixed unscheduled devaluation, in turn, can either be exogenous or endogenous. We first endogenized the size of the devaluation on the degree of exchange rate appreciation with respect to the average 1987 real exchange rate level but found it statistically insignificant. So we finally assumed an exogenous and arbitrary fixed 30% unscheduled devaluation. In short, unscheduled devaluation expectations were modelled as the endogenous probability of an unscheduled devaluation times the 30% unscheduled devaluation. A full and formal description of the model is provided in Annex 2.

However, the Cetes-Pagafes interest differential (adjusted for the preannounced devaluation) does not only capture unscheduled devaluation expectations. If investors are risk-averse it also captures an exchange rate uncertainty premium. In order to evaluate empirically the existence of an exchange rate uncertainty premium we incorporated a proxy for exchange rate uncertainty, the variance of unscheduled devaluation expectations, along with the binary process describing unscheduled devaluation expectations, as a regressor in the Cetes-Pagafes interest differential regression. The variance of unscheduled devaluation expectations is easy to calculate since the latter is a stochastic binary process (see Annex 2).

The regression, which also includes a dummy for the 1989 foreign debt deal, was estimated with non-linear least squares for the October 1988-December 1990 period using monthly data. While the Pact was first announced in late 1987, the period prior to the July 1988 elections was characterized by great political uncertainty. The course of economic policy became apparent a few months afterwards and the new phase of the Pact, the PECE, was formally announced in December 1988. The econometric results are in Annex 3 and discussed below.

The econometric analysis supports our main hypothesis. A reduction in the sum of public debt maturing in the month and base money relative to the stock of foreign exchange reserves lowers unscheduled devaluation expectations. Since the lengthening of domestic debt maturity (Figure 11), induced through the introduction of "Bondes" (see Figure 10) [4/], was the main factor influencing the above variable it was also the main factor behind the sharp decline in the peso-dollar interest differential during the period.

There was no econometric evidence of agents demanding a premium for exchange rate uncertainty, as measured by the variance of the postulated process for devaluation expectations. The dummy for the foreign debt agreement had the expected sign but was only significant at an 80% level of confidence. Other explanatory variables tested but found to be statistically insignificant were: for the probability of devaluation, the primary fiscal surplus; and for the size of the expected devaluation, the level of real exchange rate appreciation with respect to a given base year.

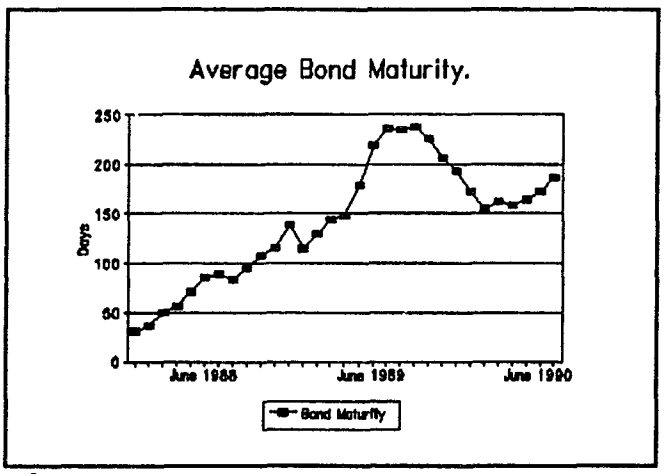


**Figure 11**

4/ The lengthening of debt maturity was first attained by the introduction of medium-term (2 to 3 year) floating rate bonds indexed to the 28 day Cetes, called Bondes, in mid-1988. In 1990, the lengthening of debt maturity responded to a shift from 28 day Cetes into 90, 180 and 365 days Cetes. The 180 and 365 Cetes were introduced in 1990 and the long-term (up to 5 years) inflation-indexed bonds, called Ajustebonos, were introduced in late 1989.

One shortcoming of the econometric approach followed is that debt maturity is treated as exogenous. Since in fact it may be endogenous this may be the source of an inefficient estimation. If investors lack confidence they may prefer short-term debt either because it is more costly to repudiate or because existing short-term debt is paid before long-term debt (Guidotti-Kumar 1991). However, while an endogenous debt maturity cannot in general be discarded, in the case of Mexico the government played a key role in determining the maturity structure by deciding the relative price at which bonds with different maturities were sold. The government received offers for given amounts of the different bonds at a given interest rate. In the primary bond auctions the government then decided the cutoff interest rate for each bond which often implies that some bonds were undersuscribed and others are oversuscribed. Thus, the government could have induced a lengthening of debt maturity, i.e., set the maturity exogenously, by increasing the quota for longer term maturities and by raising the cutoff interest rate at which it took offers.

## 5. EXCHANGE RATE POLICY, PRIVATE SAVING AND GROWTH.

The key macroeconomic factor currently challenging the sustainability of Mexico's economic recovery is the declining trend in nominal private saving. Did real, as opposed to nominal, private saving also decline? If so, can the decline in private saving be traced back to government policies? While there are no obvious policy distortions I argue that the anti-inflation bias of Mexico's exchange rate policy has led to strong real peso appreciation after 1987. Has the sharp real peso appreciation exerted an adverse impact on private saving? If so, is the current exchange rate policy compatible with a sustainable economic recovery? And if not, what are the main policy options?

Mexico's nominal domestic private saving declined about 10 percentage points of GDP between 1983-87 and 1991. Although much of this decline can be ascribed to lower inflation (as nominal interest payments received by the private sector have fallen with inflation) an inflation-adjusted measure of private saving (obtained residually from the current account deficit and real public saving) still shows a marked decline in private saving. Based on an estimated US$11-12 billion current account deficit for 1991, about half of the current account deterioration since 1983-87 was due to higher investment and the remainder was due to lower real private saving as real public saving actually improved (Table 1). It is worth noting that only about one-third of the decline in real private saving, and the corresponding increase in public saving, was accounted for by a reduction in the domestic real public debt service.

The decline in private saving may have been caused by legitimate macroeconomic factors, e.g., Mexico's improved economic prospects could have lead to an upward revision of permanent income and/or reduced uncertainty. It is therefore potentially risky to introduce policy changes in response to lower private savings, particularly, in the absence of obvious policy distortions. However, it is conceivable that the anti-inflation bias of Mexico's exchange rate policy has been largely responsible for the sharp real peso appreciation observed in 1988-91. The government first fixed the exchange rate and later on

preannounced daily devaluations at a rate which was systematically below the domestic-foreign inflation differential. Below I argue that the decline in private saving was in fact induced by such policy-induced real peso appreciation.

Table 1. Sources of the Current Account Deterioration Between 1983-87 and 1991
(in percentage points of GDP)

| | | |
|---|---|---|
| 1. Increase in Public Saving | 5.4 | |
| 2. Increase in Private Saving | -8.8 | |
| 3. Net Increase in Domestic Saving (=1+2) | | -3.4 |
| 4. Net Increase in Investment | | 3.5 |
| 5. Change in Current Account Balance (=3-4) | | -6.9 |

Notes. 1/ Aggregate investment in constant 1980 pesos.
3/ Public saving is defined as the sum of the inflation-adjusted economic balance and public investment.
4/ Private saving is obtained residually.
5/ 1991 figures based on the following estimates: a current account deficit equivalent to 4.5% of GDP, a 12.2 rate of investment growth, a 4% rate of GDP growth, an operational fiscal surplus equivalent to 3% GDP and a 5% public investment-GDP ratio.

Sources. "Indicadores", Banco de Mexico 1991 and own estimates.

The real peso appreciation has been a key factor behind the deterioration of Mexico's non-oil trade balance (regression 1 in Table 2); between 1987 and 1991 the current account balance turned from US$4 billion surplus into a US$11-12 billion deficit. From a macroeconomic point of view this was accounted for both by the favorable effect of a more appreciated peso on investment and by the adverse effect of a more appreciated peso on private saving (regressions 2 and 3 in Table 2). There is evidence that the positive impact on private investment of a real peso appreciation stems, by and large, from the implied reduction in the cost of capital goods (van Wijnbergen (1991) and Warner (1991)). Less is known about the negative impact of the real peso appreciation on private saving although there is empirical evidence for other countries that a real exchange rate appreciation (devaluation) is expansionary (contractionary), e.g., Edwards (1986). One possible interpretation is Diaz-Alejandro's (1965) hypothesis that devaluations are contractionary because it redistributes income from low savers to high savers. Another possibility is that an anticipated real peso appreciation leads to lower domestic real interest rates which, in turn, discourage saving. [5/]

5/ However, the impact of real interest rates on private saving was found to be statistically insignificant (see note of Table 2).

Table 2. Macroeconomic Impact of Real Exchange Rate Fluctuations.

Method of Estimation: OLS

Regression 1.

$$X-M = -2735 + 0.715*(X-M)_{-1} + 2234*REER - 533*D2 - 596*D3 - 247*D4$$
$$(-5.7)\quad (15.7)\qquad (6.6)\qquad (-3.9)\quad (-4.4)\quad (-1.8)$$

SMPL: 1980.1-1990.4 $\quad R^2 = 0.97$ $\quad$ D-W = 1.92

Regression 2.

$$Ip/Y = 0.0425 + 0.889*(Ip/Y)_{-1} - 0.02*REER$$
$$(2.3)\quad (10.7)\qquad (-2.4)$$

SMPL: 1983.1-1990.4 $\quad R^2 = 0.86$ $\quad$ D-W = 2.02

Regression 3.

$$Cp/Yd = 0.0352 + 0.531*(Cp/Yd)_{-1} - 0.0325*REER - 0.0329*D4 + 0.0184*BRADY$$
$$(4.0)\quad (4.1)\qquad (-2.3)\qquad (-6.7)\qquad (2.7)$$

SMPL: 1983.1-1990.4 $\quad R^2 = 0.81$ $\quad$ D-W = 1.92

Notation: X-M deflated non-oil trade surplus
REER real exchange rate of Mexico vis a vis US (Producer Prices)
D2, D3, D4 seasonal dummies
Ip/Y private investment GDP ratio
Cp/Yd ratio of private consumption to disposable income (defined as quarterly GDP minus taxes)
BRADY a dummy which takes value 1 since the second half of 1989 to account for the foreign debt agreement for debt reduction
t-statistics in parenthesis

Note: real interest rates (measured as Cetes minus past inflation) were also tested in regressions 2 and 3 but found to be statistically insignificant.

The decline of private saving could put at risk Mexico's economic recovery as the accumulation of external liabilities is not backed by additional resources to service them in the future. This problem could be exacerbated if the real peso appreciation shifts an increasing portion of investment, the other factor behind large current account deficits, to the non-tradable sector. While the sustainability of current account deficits ultimately depends on the availability of foreign capital, which in 1990-91 over-financed the current account deficit, the volatile nature nature of recent capital inflows makes Mexico extremely vulnerable to domestic and external shocks even in the short term. Besides, over the medium term other problems may arise. The initially expansionary impact of a real peso appreciation on domestic aggregate demand is likely, over time, to be offset by the adverse employment effects of a shift from goods produced domestically to foreign goods (precisely, due to the ongoing real peso appreciation), i.e., a J-curved response of aggregate demand to the peso

appreciation over the medium term. In short, Mexico's main risks are its increase dependence on volatile capital inflows over the short term and a recession over the medium term.

What are the policy options? Mexico already has tight fiscal and monetary policies in place. A further tightening may not be effective, in the case of monetary policy (as sterilization could encourage more capital inflows), nor efficient, in the case of fiscal policy (due to social and infrastructure bottlenecks). In the short term, though, Mexico may not have other options than further tightening its monetary and fiscal policies as its exchange rate policy is strongly tied to the anti-inflationary strategy and already committed for 1992. Increasing the rate of devaluation while the economy is booming is, in any case, likely to be more inflationary and, thus, less effective, than otherwise.

Over the medium term a gradual real peso depreciation appears necessary, however, because as time goes by the risk of a recession induced by an appreciating real exchange rate will increase. In particular, foreign investors will require a more depreciated exchange rate to absorb extra output from their new investments.

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ANNEX 1. Explicit Debt Repudiation. Econometric Results

Arbitrage between peso- and dollar-denominated domestic debt (respectively Cetes and Pagafes) implies:

(1) $(1 + R_c) = (1 + R_p)*(1 + \epsilon)*(1 + \alpha*\sigma)$

where: $R_{c,p}$ is the rate of return of asset c (Cetes) and p (Pagafes)
$\sigma$ is a measure of exchange rate uncertainty
$\alpha$ is the coefficient of risk aversion
$\epsilon$ is the expected rate of devaluation

Similarly, arbitrage between domestic dollar-denominated debt (Pagafes) and the assumed riskless US Treasury Bill implies:

(2) $(1 + R_p) = (1 + R_{TB})*(1 + \Sigma)*(1 + \beta*\Gamma)$

where: $R_{TB}$ is the rate of return on "safe" US Treasury Bills
$\Sigma$ is the expected rate of Pagafe repudiation
$\Gamma$ is a measure of debt repudiation uncertainty
$\beta$ is the coefficient of risk aversion

In order to assess the impact of fiscal policy on explicit debt repudiation expectations, we hypothetize that debt repudiation expectations is a linear function of lagged primary fiscal surpluses and of the degree of indexation:

(3) $\Sigma = \Phi_1 + \Phi_2*y + \Phi_3*I$

where: $\Sigma$ is the expected rate of Pagafe repudiation
y is the lagged primary fiscal surplus
$\Phi_1$, $\Phi_2$ and $\Phi_3$ are constant terms
I is the degree of domestic indexation (dollar and inflation-indexed)

We then substitute (3) in equation (1) to obtain an expression for the Pagafe-US Treasury Bill interest differential:

(4) $(1 + R_p)/(1 + R_{TB}) - 1 = \Phi_1 + \Phi_2*y + \Phi_3*I$

Equation (4) is estimated using OLS. Up to 3 lags for variable y were initially considered. A dummy for the foreign debt agreement is included in the regression and, since we detected first order serial autocorrelation, we also included the dependent variable lagged one period as a regressor. Since the Pagafe-US T.Bill differential is not directly affected by exchange rate policy, to the extent that both are dollar denominated assets, the period of analysis is March 1987-December 1990; Pagafes were first issued in late 1986. Results for the resulting regression, equation (3) below, are reported in Table 1.

(5) $(1 + R_p)/(1 + R_{TB}) - 1 = \Phi_1 + \Phi_{2\text{-}1}*y_{-1} + \Phi_{2\text{-}2}*y_{-2} + \Phi_3*I +$

$$c_1*[(1 + R_{p-1})/(1 + R_{TB-1}) - 1] + c_2*D1$$

Table 1. Estimates Regression 3.

Method of Estimation: OLS.
Sample: March 1987-December 1990.

| | Coefficient | Standard Error | T-Statistic |
|---|---|---|---|
| $\Phi_1$ | 0.108 | 0.036 | 2.976 |
| $\Phi_{2-1}$ | -4.464E-05 | 2.213E-05 | -2.018 |
| $\Phi_{2-2}$ | -4.114E-05 | 2.220E-05 | -1.853 |
| $\Phi_3$ | 0.857 | 0.433 | 1.979 |
| $c_1$ | 0.608 | 0.101 | 6.019 |
| $c_2$ | -0.053 | 0.020 | -2.422 |
| R-squared | | 0.716 | |
| Durbin-Watson Stat. | | 1.821 | |
| Log likelihood | | 68.687 | |
| F-statistic | | 19.669 | |

All variables were statistically significant and their coefficients carried the expected sign, i.e., higher indexation and lower primary fiscal surpluses raised debt repudiation fears.

## ANNEX 2. A Model of Devaluation Expectations/Uncertainty

We assume that an unscheduled (not preannounced) exchange rate devaluation $x_t$ has the binary distribution:

(1) $x_t = x_t$ (constant) with probability $p_t$ $t = 1...T$
$= 0$ with probability $(1 - p_t)$

Thus, the expected value of $x_t$ is:

(2) $E(x_t) = x_t*p_t$

And its variance (Mood Graybill (1963)) is:

(3) $\sigma(x_t) = E(x_t^2) - [E(x_t)]^2 =$

$= x_t^2*p_t - x_t^2*p_t^2$

The total expected devaluation has a certain component, the preannounced devaluation rate $x_t^p$, and an uncertain component, $x_t$:

(4) $\epsilon = (1 + x_t^p)*(1 + E(x_t)) - 1$

Thus, based on equations (3) and (4) and equation (1) of Annex 1, and taking

the variance of $x_t$ as the proxy for exchange rate uncertainty, the Cetes-Pagafes interest differential adjusted for the preannounced rate of devaluation is:

$$(5)\quad (1 + R_c)/(1 + R_p)*(1 + x_t^p) = (1 + E(x_t))*(1 + \alpha*\sigma(x_t)) =$$

$$= (1 + x_t*p_t)*(1 + \alpha*(x_t^2*p_t - x_t^2*p_t^2))$$

We may focus on the particular case in which the probability of a devaluation of size $x_t$, $p_t$, is described by the following linear process:

$$(6)\quad p_t = \mu_1 + \mu_2*y_t + \mu_3*z_t$$

where: $\mu_1$, $\mu_2$ and $\mu_3$ are constant coefficients
y, z are explanatory variables, e.g., domestic debt

The size of the devaluation $x_t$ can be either considered exogenous or endogenous, e.g., on a measure of real exchange rate appreciation:

$$(7)\quad x_t = \tau_1 + \tau_2*e_t$$

where: $\tau_1$, $\tau_2$ are constant coefficients
e is an explanatory variable

Substituting (6) and (7) in (5):

$$(8)\quad (1 + R_c)/(1 + R_p)*(1 + x_t^p) = [1 + (\tau_1 + \tau_2*e_t)*(\mu_1 + \mu_2*y_t + \mu_3*z_t)]*$$

$$*\{1 + \alpha*[(\tau_1 + \tau_2*e_t)^2*(\mu_1 + \mu_2*y_t + \mu_3*z_t) -$$

$$(\tau_1 + \tau_2*e_t)^2*(\mu_1 + \mu_2*y_t + \mu_3*z_t)^2]\}$$

## ANNEX 3. Devaluation Expectations/Uncertainty. Econometric Estimation

Equation (8) of Annex 2 was estimated econometrically employing non-linear least squares (NLS). All regressions were run for the period October 1988-December 1990. The dependent variable is based on annualized rates for Cetes and Pagafes of 28 days. Interest rates for month t are measured at the end of month (t-1) and the preannounced devaluation for month t is equal to the actual devaluation of the controlled exchange rate between the beginning and the end of month t. The initial set of explanatory variables is: the difference between public debt maturing in the month plus base money and foreign exchange reserves (variable z); the primary fiscal surplus (variable y); and the degree of real peso appreciation compared to the average 1987 level (variable e). Variables z and y are real, deflated by the CPI, and variable e measures the difference between the real exchange rate of the peso against the US dollar in the period and the real exchange rate in 1987 as a percentage of the real exchange rate in 1987. A dummy was included in all regressions for the Brady deal: the dummy takes value 0 up to June 1989 and value 1 thereafter. When serial

autocorrelation was detected the dependent variable was included lagged one period as a regressor.

The expected signs for the coefficients are:

(1) $\alpha > 0$ , $\mu_2 < 0$ , $\mu_3 > 0$ , $\tau_2 > 0$

The primary fiscal surplus and real exchange rate appreciation were not found to be statistically significant factors of, respectively, the probability of a devaluation and the size of the expected devaluation. The regression was, thus, reestimated excluding these variables assuming that the size of the expected devaluation was a fixed 30% and the probability of devaluation depended only on variable z. In the resulting regression the coefficient $\alpha$ was statistically insignificant (it was also insignificantly different from zero in the previous regressions). So we re-ran the regression eliminating $\alpha$, i.e., making it equal to zero. We finally re-ran the regression without $\mu_1$ since it was also found to be insignificantly different from zero. After sequentially eliminating all statistically insignificant coefficients, as described above, we were left with the following regression reported in Table 1:

$$(2)\ [(1 + R_c)/(1 + R_p)*(1 + x_t^p) - 1] = 0.3*(\mu_2*z_t) + c_1*D1 + c_2*[(1 + R_{c-1})/(1 + R_{p-1})*(1 + x_{t-1}^p) - 1]$$

Table 1. Estimates Regression 2.

Method of Estimation: NLS (Non-Linear Least Squares).
Sample: October 1988-December 1990.

| | Coefficient | Standard Error | T-Statistic |
|---|---|---|---|
| $\mu_2$ | 0.226 | 0.0752 | 2.998 |
| $c_1$ | -0.017 | 0.0174 | -0.974 |
| $c_2$ | 0.308 | 0.1993 | 1.546 |

| | |
|---|---|
| R-squared | 0.272 |
| Durbin-Watson Stat. | 1.686 |
| Log likelihood | 46.728 |
| F-statistic | 4.481 |

It follows that only variable z was a significant factor with the expected sign of the Cetes-Pagafes interest differential (adjusted for the preannounced devaluation). There is no evidence, under the present model, of agents demanding a premium for exchange rate uncertainty, i.e., agents are not risk-averse. The dummy for the foreign debt agreement has the expected sign but is only significant at an 80% level of confidence.

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